A container set for mixing at the time of administration

FIELD OF THE INVENTION

The present invention relates to a set of containers for mixing its contents at the time of administration, which is capable of storing freeze-dried solid form of medication and either solvent or dispersion medium separately, and for mixing them at once in administration.

BACKGROUND ART

As this kind of conventional container set for mixing at the time of administration, an applicant of the present invention has conventionally developed such that are disclosed in Japanese published unexamined application 2001-9471 gazette and Japanese published unexamined application H08-280807 gazette. These conventional mixing containers in administration are composed of a solid ingredient storing part and a liquid ingredient storing part separately from each other. At the timing of use, these storing parts are connected so that the solid ingredient is dissolved or dispersed into the liquid ingredient, and this medical agent is sprayed.

Said conventional type of container set for mixing at the time of administration is filled up with the solid ingredient and the liquid ingredient and tight sealed under sterile conditions in a packing factory, kept and transported with being kept sterile, and at the timing of use, the inside of which is not exposed to the ambient air. So it is capable of being handled highly hygienically and preventing beneficial effect from being lost by conducting dissolution just before use.

However, there is a problem that overall height of the container in the timing of use 50 is high so that the performance for storage and handling would be

less effective, because the container has each storing units to store two medicines (i.e. the solid ingredient and the liquid ingredient) separately before mixing, and even after mixing, the container still equips with the storing units integrally. Moreover, according to the intention of use or the behavior of the medicine, there is a case that there is no problem if the solid ingredient and the liquid ingredient are exposed to the quantity of ambient air at the timing of mixing operation in administration. In said case, there is no need to use said conventional mixing container in administration, which would be a cause of a new construction of manufacturing facilities and efficiency reduction during filling up at the packing factory. In this case, conventionally, a vial bottle, a solvent container different from the vial bottle, and a spray bottle are sold as a set, and at the timing of use, a solid ingredient in the vial bottle is mixed and dissolved into a liquid ingredient in the solvent container and this mixed medicine is filled in the spray bottle for use. However, when these three containers are packed and sold as a set, packing materials will become bigger, the cost for storing and transporting will be more expensive and it will not be preferable for the environment because the vial bottle and the solvent container will be unwanted so that the quantity of wastes will increase.

Additionally, during transferring of the medicine between the solvent container and the vial bottle, the medicine may seep even with a careful treatment so that it will be difficult to mix two medicines in a concise rate and also, if the wet medicine attaches outside of the container, bacteria would breed so that it would be a problem in a view of an aspect of good hygiene.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a container set for mixing at the time of administration, which is able to store each of two components in

each container and carry out a mixing operation in administration surely without seeping liquid medicine by the means wherein especially airtight state of the mouth of the liquid container is kept until the containers are connected each other.

The container set for mixing at the time of administration in this invention may comprise a first container which has a first opening portion, a plug body which is removably attached to the first opening portion so that an internal space of the first container is sealed off against ambient air, a second container which has a second opening portion, a cap which is attached to the opening of the second container. As just described, by forming the first container and the second container separately and sealing each of the openings with the plug body or the cap, it is able to put aseptically the freeze-dried medicine and the liquid ingredient, which is its solvent and so on, into the containers with the conventional facilities and processes. The first container may preferably be comprised of the vial bottle, and the second container be preferably comprised of a blow-formed resin bottle with a vapor barrier property suited to store the liquid ingredient. Each container may have a body portion, which has a bottom, on its opening portion integrally, and internal space of this body portion may be used as a storing room for content. The plug which seals the opening of the first container is preferable a rubber plug made from Butyl-rubber and the like. To make the plug sealing more assured, an aluminum foil on the plug body may be put or the cap may be attached on the opening portion of the first container in a manner wherein the plug body is covered and held.

Said cap may have a first cap part which is attached to the second opening portion liquid tightly and a second cap part which is fitted liquid tightly to the first cap part and has a connecting opening portion which is connectable to the first opening portion liquid tightly. This second cap part may be relatively

movable from a first position where the first and second cap parts seal internal space of the second container off from ambient air, to a second position which is located axially inward from the first position. Also, when the second cap part is located at the second position, a connecting path may be formed in the cap, the path connecting internal space of the first container and internal space of the second container, the internal space of the first container connected to a connecting opening portion of the second cap part. Additionally, said connecting opening portion may be configured to be connectable to the opening of the first container, when the second cap part is located at the first position. Also, each of the cap parts may be formed in a tube shape and internal space of these cap pats may serve as said connecting path.

According to the container set for mixing at the time of administration of the present invention, during transport and storage, solid ingredient such as freeze dried medicine may be stored in the first container in the antiseptic condition, and liquid ingredient which serves as solvent or dispersion medium of the solid ingredient may be stored in the second container in the antiseptic condition. When a patient or a nursing attendant mixes in administration, first of all, the plug body is detached from the opening of the first container and the connecting opening portion of the second cap part of the second container turned upside down is connected to the first opening portion which opens upwardly. In this time, the second cap part is still located at the first position and the second opening portion keeps being sealed so that the liquid ingredient in the second container does not leak. Next, the second container connected to the opening portion of the first container is pushed to the first container side, the second cap part is pushed by the first container and moved from the first position to the second position, said connecting path is formed in the cap, and the liquid ingredient in the second container is displaced in to the first con-

tainer without leaking. After mixing (dissolution or deconcentration) efficiently, the second container is turned with being connected to the first container, so that the mixed liquid medicine is displaced from the first container turned upside down to the second container passing through the connecting path. Then, the first container and the cap are detached from the opening portion of the second container, and a discharging unit such as an eye-dropper nozzle or a pump spray unit is attached to the second opening portion, so that it is capable to use the second container as a discharging container of the mixed liquid medicine.

In the said container set for mixing at the time of administration of the present invention, the first cap part may be configured to engage to the second opening undetachably when the second cap part is located at the first position, and such that said engagement to the second opening portion is released when the second cap part is located at the second position. With this configuration, until the second cap part is moved from the first position to the second position by said mixing operation in administration, the first cap part is not able to be detached from the second opening portion, so that it is able to prevent the cap from being detached from the second container without discretion and assuredness of mixing operation is ensured.

Also, the first cap part may have an engaging portion which is releasably engaged to the second opening portion in a manner wherein moving in an axial direction to the second opening portion is prevented. The second cap part may have a lock portion and a release portion, the lock portion holding forcibly the engaging portion so as to engage to the second opening portion when it is located at the first position, the release portion engaging the engaging portion so as to be moved to a direction such that said engagement is released when it is located at the second position. By that, until the second cap part is moved

from the first position to the second position by said mixing operation in administration, the first cap part is not able to be detached from the second opening portion, so that it is able to prevent the cap from being detached from the second container without discretion and assuredness of mixing operation is ensured. Moreover, when the second cap part is moved to the second position, the releasing portion is engaged to the engaging portion, so that an engagement between the engaging portion and the second opening portion released without fault, so the cap is easily released without fault from the second container after the mixing operation.

Also, the first cap part may have an inside tube portion which is extended outwardly in the axial direction of the second opening portion and a plug which is fixed at an end of the inside tube portion. The external diameter of the plug may be smaller than the internal diameter of the first opening portion, an opening portion may be formed between the plug and the inside tube portion, the connecting opening portion may be fitted into the first opening portion, the inside tube portion is fit into the connecting opening portion, the plug may be fitted liquid-tight into an end portion of the connecting opening portion when the second cap part is located at the first position so that the connecting path is closed, and the plug may be released from the connecting opening portion when the second cap part is located at the second position so that the connecting path is formed.

Moreover, said plug may be formed separately from the inside tube portion and the said plug is attached to the inside tube portion from the axially end side, so that an external rim of the plug is engaged to an end surface of the connecting opening portion of the second cap part. By that, the second cap part is prevented from detaching from the first cap part by the plug, and structures are simplified and fabrications are progressed.

Also, the plug and the inside tube portion may be formed integrally, the plug and the inside tube portion may be connected integrally through multiple connecting ribs which are spaced and placed peripherally, and the space between the connecting ribs may serve as an opening portion. By that, it is able to aim reducing of numbers of structure units, so that it is able to aim further cost reduction.

Moreover, the container set for mixing at the time of administration in the present invention may have a stopper mounted detachably. The stopper is contact to the second cap so as to be prevented from moving from the first position to the second position. By that, it is able to prevent the second cap part from being accidentally moved to the second position, the opening portion of the second container from being opened, and the liquid ingredients from being exposed to the ambient air. Additionally, the stopper may be detachably attached to an external peripheral of the body portion of the second container, or to an external peripheral of the first cap part.

Also, the connecting opening portion of the second cap part is to be fitted in to the first opening. The second cap part may further have an engaging piece which is located radially outside of the connecting opening portion and extends to an axial end side. The first opening may have a flange portion projected radially outside, and said engaging piece may be engaged axially to a rim of a base end side of the flange portion when the connecting opening portion is fitted in to the first opening portion. By that, when the connecting opening portion is connected to the opening portion of the first container, the first opening portion is held by the engaging piece formed around the external peripheral of the connecting opening portion, so that the cap may be detached together with the first container from the second container by detaching the first container from the second container after mixing operation finishes. There-

fore, it is able to simplify an operation of a pro-process after mixing and shorten the amount of time from mixing to using.

Also, the container set for mixing at the time of administration in the present invention, the first cap part may mainly comprise a first tube portion which is mounted onto the external peripheral side of the second opening portion and a second tube portion which is linked to the first tube portion. An internal diameter of the second tube portion may be smaller than the internal diameter of the second opening portion. The second cap part may have a plug which is fitted into a base end portion of the second tube portion. The plug may be formed to close the connecting path when the second cap part is located at the first position and form the connecting path when the second cap part is located at the second position. Moreover, the first cap part may further have a third tube portion which is linked to an other end side of the second tube portion. The connecting opening portion of the second cap part may be fitted into the first opening portion. The second cap part may have a flange portion which extends radially outwardly from the base end portion of the connecting opening portion. Said flange portion may be fitted into the third tube portion and an internal peripheral surface of the third tube portion may have an engaging protrusion portion which engaged to the flange portion in a manner wherein the second cap part is prevented from moving from the first position to the second position. The third tube portion may be elastically deformable in an axially external direction in a manner wherein the engagement between the engaging protrusion portion and the flange portion is released.

By using aforementioned container set for mixing at the time of administration, it is possible to operate following procedure for mixing in administration. The procedures of the present invention for mixing in administration are: (1) the solid ingredient is sealed and stored in the first container and the

liquid ingredient which is to be solvent or carrier fluid is sealed and stored in the second container; (2) at the timing of use, the first container is opened while a sealing storing state of the second container is kept, the second container is connected to the opening portion of the first container, the connecting path which connects the internal space of the first container and the internal space of the second container is formed, the first ingredient and the second ingredient are mixed through the path, and the mixed liquid medicine is stored in the second container; (3) after said mixing, the first container is detached from the second container, the discharging unit which is used for discharging liquid in the second container is attached to the second container so that the mixed liquid medicine in the second container becomes dischargeable, and the second container used as a liquid ingredient container is used as a mixed medicine discharging container. By that, at the timing of storing or shipping before mixing in administration, the number of containers which comprises a set are two, so that the package will not be too big compared to the case wherein there is a spray container formed separately, so it is possible to attempt to handle easily and reduce the cost. Additionally, the second container, which is used as storing container for the liquid ingredient before the mixing in administration, is reused as the discharging container for the mixed liquid medicine, so that the cost reduction by reducing constituent elements, waste reduction and the improvement of the environment may be attempted.

In the aforementioned present process invention, it is more preferable that the first container comprises the bottle body made from a material which has a good gas barrieracy such as glasses (e.g. a conventional vial bottle). By that, by freeze-drying in the bottle body, the solid ingredient is stored in the bottle body in the antiseptic condition, and especially, it is possible to store unstable freeze-dried medicine in the glass container stably.

Additionally, to hold the plug body attached on the first opening of the first container without fault, it is possible to attach a top member (e.g. A ring shaped top with a lock mechanism disclosed in Japanese published unexamined application H09-278051 gazette) on the first opening. This top member may have an engaging member which has multiple talons around a rim of a discotic top plate portion, and a cylindrical holder member which is fixed to an external side of the multiple engaging talons of said engaging member. The engaging talon, of which a lower end side is elastically deformable radially expanded and reduced, may extended from the rim of the top plate portion to down below. An upper end of the engaging member and a lower side of the holder member are molded integrally, trough the breakable connecting portion. When this top member is used, connecting portion is broken by pushing the holder member downward relatively to the engaging portion, the holder portion is attached onto the external peripheral of the multiple engaging talons, and the multiple engaging talons are deformed radially inwardly by the holder member, so that this engaging talon is engaged to the external peripheral of the first opening portion. Preferably, engaging portions (concave portion or protrude portion), which are engaged each other when the holder member is attached to the external peripheral of the engaging talons, may be formed on each internal peripheral surface and external peripheral surface, so that the holder member is prevented from detaching accidentally. Also, thread portions, which are screwing each other, may be formed on the internal peripheral surface of the holder member and the external peripheral surface of the engaging talons, so that the holder member is screwed to the multiple engaging talons. By that, it is capable to prevent the holder member from being detached accidentally and to detach the holder member with comparatively light strength by rotating the holder member, while the engaging talons are strongly pushed toward radially inward.

Also, when the holder member which is attached to the external peripheral of the engaging member is pulled up, the engaging portion which engages to the external rim of a neighborhood of the upper end of the engaging member may be located on a internal peripheral of the neighborhood of the lower end of the holder member, so that it is capable to detach the engaging member from the opening portion as the holder is pulled up. This top member is preferably used for holding the plug body made from Butyl-rubber which is attached to the opening portion of the glass vial bottle and improving the assuredness of the air tightness, and may be reused in other than the container set for mixing at the time of administration in the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 Longitudinal sectional view of a container set for mixing at the time of administration of a first embodiment of the present invention, especially, (a) shows a resin bottle which is used as both a solvent container and a spray bottle and (b) shows a vial bottle;

Fig. 2 Front view of the resin bottle of the mixing container in administration;

Fig. 3 Process drawing of the mixing process in administration of the mixing container in administration;

Fig. 4 Longitudinal sectional view of the container set for mixing at the time of administration of a second embodiment of the present invention, especially, (a) shows a discharging nozzle as a discharging unit, (b) shows a vial bottle and (c) shows a resin bottle for use as a solvent container and an otological medicine container;

Fig. 5 Process drawing of the mixing process in administration of the mixing container in administration;

Fig. 6 Longitudinal sectional view of a container set for mixing at the time of administration of a third embodiment of the present invention, especially, (a) shows a discharging nozzle as a discharging unit, (b) shows a vial bottle and (c) shows a resin bottle for use as a solvent container and an eye drops discharging container;

Fig. 7 Process drawing of the mixing process in administration of the mixing container in administration;

Fig. 8 Longitudinal sectional view of a container set for mixing at the time of administration of a forth embodiment of the present invention, especially, (a) shows a resin bottle for use as a solvent container and a spray bottle, (b) shows a vial bottle;

Fig. 9 Front view of the resin bottle of the mixing container in administration;

Fig. 10 Process drawing of the mixing process in administration of the mixing container in administration.

THE PREFERRED EMBODIMENTS

With reference to the attached drawings, the present invention will hereinafter be described by way of an embodiment thereof.

Figs. 1 to 3 illustrate a mixing container in administration of a first embodiment of the present invention. This mixing container in administration has mainly a vial bottle 1 (a first container) for storing a solid ingredient made from freeze-dried medicine, a resinous bottle 2 (a second container) for storing a liquid ingredient as solvent or fluid for the solid ingredient. Additionally, said liquid itself may have an active ingredient. This set can be preferably used as, for example, a pump spraying container for collunarium, and also, used in ad libitum application.

The vial bottle 1 is made from glass and it has an opening portion 4 (a first opening portion) integrated with an upper end of a body 3 which has a cylindrical shape with a bottom. A plug body 5 made from rubber such as Butyl-rubber is liquid tightly plugged in this opening portion 4 and a top member 6 (a plug body block) is coated on it to prevent the plug body 5 from accidentally being pulled off. Also, an upper end of the opening portion 4 has a flange portion 7 which is projecting radially. Said top member 6 is attached to the opening portion 4 by engaging to this flange portion 7. The flange portion 7 may be formed on axial midstream of the opening portion 4. Forming the flange portion 7 on axial midstream causes a structure of an upper surface of an opening of the vial 1 to be two-tier and there is a gap between the flange portion 7 and a brim portion 9 of the plug 5, so that it enables pulling off the plug body 5 easily by putting a tip of fingers into this gap.

The plug body 5 has an airtight stopper 8 which is fitted in the opening portion 4 and the brim portion 9 which touches an upper surface of the opening portion 4 integrally. An external diameter of the brim portion 9 is almost the same as the flange portion 7 of the opening portion 4. At a side portion of the airtight stopper 8, a concave part 10 which extends from its lower end upwardly is formed. An half plugged state, in which an upper end of the concave part 10 is located above an upper end of the opening portion 4, the concave part 10 forms an air pass between the plug body 5 and the opening portion 4. On the other hand, a plugged state, in which the plug body 5 is pushed till the brim portion 9 touches the upper surface of the opening portion 4, the upper end of the concave part 10 is located inward (below) the upper end of the opening portion 4 so that the opening portion 4 is sealed air tightly.

The top member 6 has an engaging member 13 which has multiple talons 12 around a rim of a discotic top plate portion 11, and a cylindrical holder

member 14 which is fixed to an external peripheral side of the multiple engaging talons 12 of said engaging member 13. These engaging members 13 and the holder member 14 may be, at the timing of the production, molded integrally through a connecting portion which is able to be broken easily. At the timing of capping which follows filling up the vial bottle 1 with freeze-dried medicine, the connecting portion may be broken by pushing the holder member 14 and both of them may be separated. Additionally, it is preferable to make the top member 6 from resin which is discarded by incinerating.

In the illustrated embodiment, eight engaging talons 12 are placed at the same intervals surrounding around the opening portion 4 and there is a slit between two engaging talons next to each other. Each engaging talon 12, of which a lower end side is elastically deformable radially expanded and reduced, is formed as a long plate, extended from the rim of the top plate portion 11 to down below, and formed wherein the lower end side is expanded radially outwardly more than the upper end side in a non-transformed state. On an inside peripheral surface of the engaging talon, there is an engaging protrusion portion 15 which is engageable to the flange portion 7 of the opening portion 4. There is a stretching portion 16 which projects radially outwardly at the lower end of the engaging talon 12.

The holder member 14 comprises a tube whose internal diameter is almost the same as an external diameter of the top plate portion 11, and a flange portion 17 which projects radially outwardly at the upper end of said holder member 14. A length of an axis of the holder member 14 is almost as long as a length of an axis of said engaging member 13.

To store freeze-dried medicine (solid ingredient) air tightly under aseptic condition into said vial bottle 1, first of all, drug solution is filled in the sterilized vial bottle 1 in a clean room. Secondly, the plug body 5 is half plugged

into the opening portion 4 of the vial bottle 1 and the liquid ingredient is vaporized in the freeze-drying device so that the vaporized steam is discharged through the air pass of the concave part 10 to the outside of the bottle. Next, the plug body 5 is plugged completely into the opening portion 4 so that the freeze-dried medicine is air tightly sealed and kept in the room of the vial bottle 1. Then, the engaging member 13 of the top member 6 is lied over the plug body 5 and the opening portion 4 and the holder member 14 is pushed strongly, so that the connecting portion 15 gets broken, the holder member 14 is attached around the external peripheral side of the engaging part 13, the engaging talons 12 are elastically deformed radially internally by the holder member 14, and the engaging protrusion part 15 is engaged to the flange portion 7 of the opening portion 4. In this top-member-6-fixed-state, the plug body 5 is held completely by the top member 6 unless the holder member 14 is separated from the engaging member 13.

The bottle 2 is such that a cylindrical opening portion 22 is integrally molded to an upper end of a bottomed cylindrical shaped body 21. A bottomed cylindrical pedestal 23 is fixed to a lower part of the bottle 2. The bottle 2 is formed in the manner wherein the body portion 21 is, at the middle in the axial direction of it, radially bulged and formed, and its diameter is getting gradually smaller as it goes from the middle in the axial direction to a bottom. The opening portion 22 of an upper end of the bottle 2 has a cylindrical shape which opens upwardly. Its external peripheral surface has a screw portion 22a, which is used for screwing an after mentioned pump spraying device, and a flange portion 22b, which is located at a lower side (base side) of the screw portion and projected axially outwardly, is formed integrally.

In the opening portion 22 of the bottle 2, a cap 30, which is mainly comprised of a cylindrical first cap part 31 and a cylindrical second cap part 32, are

attached. During shipping or storing of the bottle 2 filled with the liquid ingredient, the opening portion 22 is sealed air and water tightly, while, at the timing of use, the cap 30 is used as a connecting adapter to the vial bottle 1, so that a two ingredients mixing process is easily carried out.

The first cap part 31 has a ring-shaped base portion 31a which touches an upper surface of the bottle opening portion 22 and a cylindrical sealing tube portion 31b which is extended from said base portion 31a, water tightly fitted to the bottle opening portion 22 and by that it is attached to the opening portion 22 water tightly. Also, the first cap part 31 has multiple engaging pieces 31c (engaging portion) extended axially inwardly (downwardly) from a brim of an outer peripheral of the base 31a. These multiple engaging pieces 31c are placed equally spaced in a peripheral direction and formed freely deformable in a manner wherein a lower end of the each engaging piece 31c is expanded radially outwardly. An engaging protrusion part 40 which engages to a lower surface of the flange 22b of the bottle opening portion 22, so that the engaging pieces 31c are de-engageably engageable to the bottle opening portion 22 in a manner that moving in a axial direction of the bottle opening portion 22 is prevented. Moreover, each engaging piece 31c has a turn-backed guiding engaging portion 31d.

Also the first cap part 31 has a cylindrical inside tube portion 31e which is extended axially outwardly (upwardly) from a brim of an inner peripheral of the base 31a, a rod 31f which integrally formed at an end portion of said inside tube portion 31e, and a plug 31g which is fixed at an end of the inside tube portion 31e by being fitted to the rod 31f. In the present embodiment, in the components of the first cap part, only the plug 31g is formed separately and the other components are formed integrally by an injection molding and the like. An external diameter of the plug 31g is smaller than an internal diameter of the

mouth portion 4 of the vial bottle 1. Also, there is an opening portion 41 formed between the plug 31g plus the rod 31f and the inside tube portion 31e, so that the liquid ingredient in the bottle 2 freely flows into an external peripheral side of the plug 31g.

On the other hand, the second cap part 32 is fitted liquid tightly onto the first cap part 31 and has a connecting opening portion 32a which is liquid tightly connectable to the opening portion 4 of the vial bottle 1. The second cap part 32 is movable relatively to the first cap part from the first position (see also Fig.1), wherein internal space of the bottle 2 is sealed from the ambient air by the first and the second cap part 31 and 32, to the second position which is located axially inwardly more than the first position. When the second cap part 32 is located at the second position, a connecting pass which connects internal space of the bottle 2 and internal space of the vial bottle 1 connected to the connecting opening portion 32a of the second cap part 32 is formed.

In more detail, the second cap part 32 has a flange portion 32b which extends from an end portion of the connecting opening portion 32a, multiple, in a peripheral direction, of engaging pieces 32c which is located radially outside of the connecting opening portion 32a and extends from the flange portion 32b to an axial end side (outside), a releasing portion 32d which extends from the flange portion 32b to an axial base side (inside), and a main body portion 32e which extends from an external rim of the flange 32b to the axial base side. Said engaging pieces 32c has an engaging protrusion part 42 on its inside surface close to an end. When the connecting opening portion 32a is fitted in and connected to the opening portion 4, the second cap part 32 is capable of zipping up the opening portion 4 of the vial bottle 1 by the manner wherein the engaging protrusion part 42 is axially engaged to a base side rim of the flange

portion 7 of the vial bottle 1.

Also, a locking portion 32f, which forcibly holds down the engaging pieces 32c from an external surface side in a manner wherein the engaging pieces 31c of the first cap part 31 are engaged to the flange portion 22b of the bottle opening 22 when the second cap part is located at the first position, inflation-formed on internal peripheral surface of the main body portion 32e of the second cap part 32, so that the first cap part is engaged to the bottle opening 22 without being separated. Said releasing portion 32d is axially separated from the guiding engaging portion 31d of the first cap part 31 and an end portion of said releasing portion 32 and the guiding engaging portion 31d is located axially opposite. When the second cap part 32 is moved to the second position, the end portion of the releasing portion 32d is engaged to the guiding engaging portion 31d, so that it moves the engaging pieces 31c to the direction wherein an engagement between the engaging pieces 32c of the first cap part 31 and the flange portion 22b of the bottle opening portion 22 is released (i.e. radially outward) so that the engagement between the first cap part 31 and the bottle opening portion 22 is released. To conduct this engagement release smoothly, both engaging surfaces of the end portion of the releasing portion 32d and the guiding engaging portion 31d are formed tapered.

Also, a neighboring structure of the plug 31g is explained in more detail as followed. An end portion of the connecting opening portion 32a is radially gathered up in a needle-nosed manner. When the second cap part 32 is located at the first position, an external peripheral rim of the plug 31g is engaged to an end surface of the connecting opening portion 32a, and an end opening of the connecting opening portion 32a is sealed water and air tightly by the plug 31, so that the connecting pass is closed. By fitting the connecting opening portion 32a in the opening portion 4 of the vial bottle 1 and moving it to the sec-

ond position, the plug 31g is separated axially from the connecting opening portion 32a and inserted into the opening portion 4 of the vial bottle 1 so that said connecting pass is formed.

Also, in this embodiment, a stopper 44, which is touched to a lower end surface of the main body portion 32e, is detachably attached to the bottle body 21 so that the second cap part 32 is prevented from moving from the first position to the second position.

Additionally, in the example illustrated in Figs., an outside cap 45 is screwed further on said cap 30 and this outside cap 45 prevents especially periphery of the plug 31g from being contaminated. It is possible to pack the cap 30 with a silver foil instead of the outside cap 45.

Next, the mixing procedure of said container set for mixing at the time of administration is explained with reference to Fig. 3.

The procedure (a) shows features at delivery, in other words, a state at the timing of the transportation and storage. When it is used, detach the top plate portion 6 and the plug body 5 from the opening portion 4 of the vial bottle 1 and the outside cap 45 of the bottle 2 is detached as illustrated in a procedure (b). Then, as illustrated in a procedure (c) and (d), the bottle 2 is turned upside down and the connecting opening portion 32a is pushed into the opening portion 4 of the vial bottle 1 so that both containers 1 and 2 are connected. The second cap part 32 is prevented from moving to the second position by the stopper 44, so that it does not happen that an end of the connecting opening portion 32a opens before finishing connecting and causes leaking.

Next, the stopper 44 is removed and the bottle 2 is further pushed, as shown in the procedures (e) and (f), so that the second cap part 32 is moved axially relatively to the first cap part 31, the plug 31 g is released from the connecting opening portion 32a, the connecting pass which connects internal

space of the vial bottle 1 and one of the bottle 2, so that the liquid ingredient in the bottle 2 flows into the vial bottle 1 through the connecting pass. Also, in this time, the releasing portion 32d of the second cap part 32 is engaged to the guiding engaging portion 31d of the engaging pieces 31c of the first cap part 31, the engaging pieces 31c are expanded their diameter radially outwardly by the releasing portion 32d, and the engagement between the engaging pieces 31c and the bottle opening portion 22 is released.

After mixing the liquid ingredient and the solid ingredient sufficiently, as shown in the process (g), it is turned upside down altogether so that the bottle 2 is located to lower side and the vial bottle 1 is located to upper side, and all of the mixed medicine flows into the bottle 2. Then, as shown in the process (h), the vial bottle 1 is pulled away from the bottle 2, so that the cap 30 is pulled away together with the vial bottle 1 since the engagement between the cap 30 and the bottle opening portion 22 has already been released as mentioned above. As shown in the process (i), a separately prepared discharging unit 50 such as pump spray unit is attached to the bottle opening portion 22 so that the bottle 2, which has been used as a container for the liquid ingredient before mixing, is used as a discharging container.

Additionally, the pump spray device 50 has a cylindrical cap member which is screwed to the opening portion 22, a suction tube which sucks up the liquid stored in internal space of the bottle 2 from a bottom of the room, a pump portion which generate a suction force to suck up the liquid through the suction tube, and a spraying portion which is used for spraying the sucked liquid to the outside. The suction tube, the pump portion and the spraying portion are formed axially in a succession, and the pump portion is fixed and held by the cap member. The suction tube is located at the middle of the axis of the bottle and extends axially along almost all length of the bottle.

Additionally, said each constructional elements are made from the material ad libitum, however, preferably, the rubber plug, the vial bottle, the plug, the top portion of the vial bottle, and bottle are made from Butyl-rubber, glass, low-density polyethylene, polypropylene, and high-density polyethylene, relatively. Other constructional elements are preferably made from polypropylene or high-density polyethylene.

Fig. 4 and 5 show a container set for mixing at the time of administration in a second embodiment of the present invention. It is especially preferably used as an otological dissolving container in administration. Hereinafter, the similar structures as said first embodiment are numbered the same symbol and of which the explanations are omitted, different structures and effects will be described and explained.

As the rubber plug 5 of the vial bottle 1, such that conventionally well known are used, and after the rubber plug 5 is fitted into the opening portion 4, the whole vial bottle 1 is packed with aluminum.

The first cap part 31 does not have said engaging pieces and is screwed onto the external peripheral of the bottle opening 22. Also the plug 31g is molded integrally with other constituent elements and the plug 31g and the inside tube portion 31e is connected integrally through multiple connecting ribs 31h which is peripherally spaced and placed. The space between the connecting ribs 31h is an opening portion 41. This plug 31g is only fitted into the inner peripheral of the connecting opening portion 32a and it is not engaged to the end surface of the connecting opening portion 32a to prevent the second cap part 32 from releasing. In this embodiment, the main body portion 32e of the second cap part 32 is fitted onto the first cap part and there is an under cut portion 46 at this fitting point so that the second cap part 32 is prevented from coming off from the second cap part 31.

Also, the releasing portion 32d, the guiding engaging portion 31d and the lock portion 32f in the first embodiment are not in the second embodiment. Moving the second cap part 32 to the second position does not automatically release engaging (screwing) between the first cap part and the bottle opening portion 22. Therefore, in the pro-processes after mixing two liquids, the vial bottle 1 and the bottle 2 are relatively revolved, so that the cap 30 is detached from the bottle opening portion 22. At this time, to prevent the second cap part 32 from spinning freely to the first cap part 31, an engaging point, wherein the second cap part staying at the second position and the first cap part 31 are engaged in the direction of rotating operation, is located at the proper position, for example, the lower end portion of the main body portion 32e of the second cap part 32. Additionally, the discharging container 50 in this embodiment has a discharging nozzle.

The mixing process in administration in this embodiment is almost the same as the one in the first embodiment, so there is a reference to Fig. 5 and detail descriptions are omitted.

Fig. 6 and 7 show a container set for mixing at the time of administration in a third embodiment of the container set for mixing at the time of administration. Only the shape of a bottle is different from the one in the second embodiment, so the same numbers are used and the explanations are omitted. In addition, it is especially preferably used as an eye dropper.

Fig. 8 to 10 show a container set for mixing at the time of administration in a forth embodiment of the present invention and it is especially preferably used as an otological dissolving container in administration. The vial bottle 1, its plug configurations, and the bottle 2 are the same as said first embodiment, so the same numbers are used and the explanations are omitted but the different configurations and the different effects are explained.

The cap 50 which is mainly comprised of a cylindrical first cap part 51 and cylindrical second cap part 52 is attached to the opening portion 22 of the bottle 2 of this embodiment. During shipping or storing of the bottle 2 filled with the liquid ingredient, the opening portion 22 is sealed air and water tightly with the cap 50, while, at the timing of use, the cap 50 is used as a connecting adapter to the vial bottle 1, so that a two ingredients mixing process is easily carried out without fail.

The first cap part 51 is mainly comprised of a cylindrical first tube portion 51a which is screwed onto the external surface side of the bottle opening portion 22, a cylindrical second tube portion 51b which is formed in a succession from the first tube portion 51a, a cylindrical third tube portion 51c which is formed in a succession from an axial end side of the second tube portion 51b, and a cup-shaped holder 51d which is formed in a succession from an axial end side of the third tube portion 51c. The first tube portion 51a has a thread portion, which screwed onto a screw portion 22a of the external peripheral of the bottle opening portion, on its internal peripheral surface. An external diameter and an internal diameter of the second tube portion 51b are smaller than the internal diameter of the bottle opening portion 22, in the illustrated example, a base end portion of the second tube portion 51b is inserted into the bottle opening portion 22. The first tube portion 51a and the second tube portion 51b are integrally connected through a flange portion 51e, and a lower surface of this flange portion 51e is facing to the opening upper surface of the bottle opening portion 22. To acquire air tightness and liquid tightness between the first cap part 51 and the bottle opening portion 22, there is a rubber packing 53 between the flange portion 51e and the bottle opening portion 22.

A third tube portion 51c is comprised in a manner wherein it is capable of fitting onto the opening portion 4 of the vial bottle 1, and when the third tube

portion 51c is fitted onto the opening portion 4, an engaging protrusion part 54, which is axially engaged to a base end portion of the flange portion 7 of the opening 4, is formed on an internal peripheral surface of the third tube portion 51c. Also, as shown in Fig. 8 and Fig. 9, the third tube portion 51c has a slit 55 so that a certain point in a circumferential direction of the third tube portion 51c is capable of being elastically deformed radially outwardly, to have the third tube portion 51c fitted easily onto the opening portion 4. The holder portion 51d has a shape which fits in the shape of a shoulder and body portion of the vial bottle 1. When the third tube portion 51c is fitted onto the opening portion 4, an external peripheral surface of the upper side of the vial bottle 1 is held by the internal peripheral surface of the holder portion 51d.

The second cap part 52 is mainly comprised of a cylindrical connecting opening portion 52a which is air tightly and liquid tightly fitted into the opening portion 4 of the vial bottle 1, a cylindrical joint portion 52b which is connected in succession to said connecting opening portion 52a and fitted into the second tube portion 51b axially slidable, a cylinder-with-a-bottom-shaped plug 52c which is fitted into an axial base end portion of the second tube portion 51b, and a flange portion 52d which is formed from an axial base end portion of the connection opening portion 52a to a radially outward direction. In these main structures, only the plug 52c is separately formed and the other structures are integrally formed. Also, an end portion of the plug 52c and a base end portion of the joint portion 52b are attached. Additionally, it is possible to form the plug 52c integrally to the joint portion 52b. Also, it is possible to combine accordingly the flange portion 52d and the connecting opening portion 52a as a separate portion part. The second cap part 52 is relatively movable to the first cap part 51 from a first position wherein the internal space of the bottle 2 is sealed from the ambient air by the first and the second cap part 51 and

52 (see also Fig. 8) to a second position which is located inward in the axial direction of the bottle 2 from the first position (see also Fig. 10(d)). When the second cap part 52 is located on the second position, a connecting path which connects the inside room of the bottle 2 and the inside room of the vial bottle 1 which connected to the connecting opening portion 52a of the second cap part 52 is formed in the cap.

In other words, the plug 52c has an opening portion 56 which goes through an inside to an outside on its peripheral wall, and when the second cap part 52 is moved to the second position, the opening portion 56 of the plug 52c is exposed under a base end portion of the second tube portion 51b so that said connecting path is opened. On the other hand, when the second cap part 52 is on the first position, the opening portion 56 of the plug 52c is stored above the lower end portion of the second tube portion 51b and said connecting path is blocked by this plug 52c.

Also, the flange portion 52d of the second cap part 52 is fitted into the third tube portion 51 of the first cap part 51. When the second cap part 52 is located at the first position, the flange portion 52d is prevented from moving to the second position of the second cap part 52 by engaging to the engaging protrusion part 54 axially. The certain point in a circumferential direction of the third tube portion 51c is capable of being elastically deformed radially outside, as stated above. So the third tube portion 51c is forcibly pushed and expanded out radially when the vial bottle 1 connected to the connecting opening portion 52a is pushed strongly, and the engagement between the flange 52d and the engaging protrusion part 54 is released so that the relative movement to the second position becomes capable.

Additionally, a cover cap 45 is attached to a top end portion of the holder portion 51d, so that the interior of the first and the second cap part are pre-

vented from contamination.

Next, with reference to Fig. 10, mixing process of the aforementioned container set for mixing at the time of administration is explained.

The process (a) shows delivery form i.e. the state at the timing of shipping or storing. When it is used, first of all, the top member 6 and the plug 5 is removed from the opening portion 4 of the vial bottle 1 and the cover cap 45 of the bottle 2 is removed as shown in the process (b). Next, the bottle 2 is turned upside down, as shown in the process (c), and the connecting opening portion 52a is pushed into the opening portion 4 of the vial bottle 1 so that both containers 1 and 2 are connected. Then, the bottle 2 is further pushed, as shown in the process (d) and (e), the second cap part 52 is moved axially relatively to the first cap part 51, the opening portion 56 of the plug 52c is exposed to the internal space of the bottle, the connecting path which connects the internal space of the vial bottle 1 and the internal space of the bottle 2 is formed in the cap 50, and the liquid ingredient in the bottle 2 flows into the vial bottle 1 through the connecting path.

After mixing the solid ingredient and the liquid ingredient sufficiently, as shown in the process (f), whole structure is turned upside down, so that the bottle 2 is located in lower side and the vial bottle 1 is located in upper side, and all of the mixed liquid medicine flows into the bottle 2. Then, as shown in the process (g), by holding the holder portion 51d and rotating whole structure of the first cap part 51, the cap 50 and the vial bottle is removed all together from the bottle opening portion 22. Additionally, the process from (d) to (g) are carried out with holding the holder portion 51d, so that it is possible to accomplish simplification and speeding up of the series of operations.

Then, as shown in the process (h), by attaching a separately prepared discharging unit 50 such as a spray pump bottle to the opening portion 22, it is

possible to use the bottle 2, which has been used as a liquid ingredient container before mixing, as a discharging container.

In the present invention, in administration, when the first container and the second container are connected so that the solid ingredient and the liquid ingredient are mixed, it is capable to precisely generate mixed liquid medicine in a defined mixing rate without leaking the liquid ingredient and handle it hygienically. Also, after carrying out the mixing operation, the mixed liquid is stored in the second container, and the discharging unit is attached to this container, and it can be used as a discharging container such as a spray container, so that it is able to operate mixing in administration precisely, at the same time, with an attempt to make a package smaller and reduce waste products.